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## Techniques for Forming Skin Panels for Large-Diameter Cylinders from Aluminum-2014

Research is currently being conducted on techniques for manufacturing skin panels from 2014 aluminum alloy for large-diameter tanks. Present production by brake forming from T651-temper material is described (see Note), and results are given of possible alternative methods by stretch-age forming and age forming.

A technical opinion is presented deriving from a study of brake forming from the T451 temper; the conclusion is that the current modified procedure, for forming of skins from the T651 temper, is the best method available without further development work. Of all methods proposed, forming from T451-temper material has the greatest potential for production of stress-free parts, but further research is required before the process will become feasible.

The age-forming characteristics of 2014-T451 and 2219-T37 alloys were compared, both aged by standard heat-treatment procedures. Elastic recovery (springback) after restrained aging was about twice as great for 2014 alloy as for 2219; for the former it was inconsistent except when stresses were made to ap-

proach the yield point by forming over a very short radius; for the latter it was consistent throughout the wide range of test levels of stress, increasing proportionately with the stress applied.

The minimum radii to which the test panels could be formed without permanent set were 33 and 52 inches for 2219-T37 and 2014-T451, respectively.

### Note:

Requests for further information may be directed to:

Technology Utilization Officer  
Code A&TS-TU  
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### Patent status:

No patent action is contemplated by NASA.

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